the charts now before the Society will be found to repay careful examination.

I do not now propose to enter into a critical discussion of their teaching, but shall content myself with pointing out two obvious conclusions which they seem to indicate.

1st. The coincidences in the apparent positions of the resolvable and irresolvable nebulæ in the heavens are very significant; we not only find the great masses of resolvable nebulæ coinciding in position with the far greater clusters of irresolvable nebulæ in the neighbourhood of *Virgo* and *Coma*, but the streams and minor clusters of nebulæ are invariably followed by streams and clusters of resolvable nebulæ; and I believe that it is impossible to ascribe these peculiarities to chance.

The case made out by Whewell, and advocated by Mr. Proctor, that the *resolvability of a star group is no criterion of its distance* seems here to be established, as far as it can be established, by such means; it has long been certain that all orders of nebulæ do exist commingled in the Nubeculæ, it is now seen to be almost equally certain that they exist commingled in other parts of the heavens.

2nd. The great aggregation of clusters in the neighbourhood of the galaxy; this fact has often been noted before; but these charts seem to illustrate it most remarkably, and the conviction cannot be avoided that the clusters are part of, and most of them probably immersed in, the Milky Way itself; equally remarkable is the complete segregation of all the nebulæ (the gaseous nebulæ excepted) from the galactic zone.

These facts surely prove beyond question that not only are the clusters, which are peculiar to the Milky Way, related to the nebulæ, which seem to form a distinct scheme, but that the two schemes are probably subordinate parts of our sidereal system.

Measures of the Diameter of Venus.

By John I. Plummer, Esq.

The accompanying series of measures of the diameter of *Venus* has been made with Airy's Double Image Micrometer upon every available occasion near the recent inferior conjunction of the planet. The greatest care has been taken to ensure a steady image, by equalising the interior and exterior temperature of the observing-room, and upon all those days when the definition of the planet was not considered sufficiently good, no observation has been attempted. On the other hand, none, after having been made, are rejected in the final results, all being assumed of equal weight. The value of a revolution of the micrometer-screw was determined from observations taken by myself upon four evenings in 1868, which leave no doubt as to the exactness of the assumed

equivalent. With the magnifying power that has been employed in these measurements (113) this equivalent is, 1 rev. = 18″·693. As the investigation of the correction due to irradiation was an important item in this inquiry, it was necessary that any change in this value depending upon temperature should be eliminated. This has been done simply and effectually by spreading the observations over that period of the year during which the temperature is continually increasing, the planet attaining its maximum diameter about the middle of the period. The results, however, do not appear to indicate that any sensible change actually exists. The measures have all been taken in full daylight, and when the planet was not far from the meridian, and are corrected for the difference of refraction of the two cusps.

Day of Observation. 1873.	h	m	Observed Diameter corrected for Refraction. ″	Calculated Diameter from Naut. Alm. ″	Obs.—Calc. ″	Log. Distance.	No. of Obs.	Int. Temp. °
Feb. 18	2	50	23·115	22·524	+0·591	9·86772	10	45·5
19	2	0	23·527	22·747	+0·780	9·86345	10	44·5
22	2	0	24·312	23·470	+0·842	9·84986	11	42·7
24	2	0	24·724	23·980	+0·744	9·84052	12	39·8
Mar. 2	3	0	26·593	25·669	+0·924	9·81096	10	44·8
4	4	0	26·837	26·296	+0·541	9·80048	12	49·9
5	5	15	27·081	26·631	+0·450	9·79498	10	45·2
12	5	30	29·624	29·096	+0·528	9·75654	13	42·4
26	2	0	36·315	35·392	+0·923	9·67146	12	51·5
27	3	30	36·969	35·967	+1·002	9·66446	12	53·2
28	1	20	37·381	36·471	+0·910	9·65842	12	52·2
29	2	45	37·998	37·071	+0·927	9·65134	12	53·2
Apr. 18	1	45	52·094	50·498	+1·596	9·51710	18	55·3
20	2	0	53·384	51·849	+1·535	9·50563	16	55·8
20	23	0	53·499	52·458	+1·041	9·50056	16	56·4
May 1	0	0	59·152	57·368	+1·784	9·46170	12	60·0
30	0	0	46·876	44·927	+1·949	9·56786	8	60·2
30	23	0	46·062	44·240	+1·822	9·57455	12	58·5
June 8	23	45	39·406	38·201	+1·205	9·63829	10	65·3
15	23	50	35·422	34·208	+1·214	9·68624	12	65·2
16	23	20	34·336	33·699	+0·637	9·69275	12	68·0
18	0	30	33·630	33·169	+0·461	9·69964	12	69·0
July 10	0	30	25·024	24·679	+0·345	9·82805	12	66·5
20	23	0	21·991	21·853	+0·138	9·88086	12	76·8
21	23	10	22·028	21·626	+0·402	9·88539	16	81·3
22	23	10	21·393	21·406	−0·013	9·88983	12	81·0

If we divide the observations into two groups depending upon the distance of the planet from the Earth, it is clear that each observation will furnish an equation of condition, involving the

true diameter of the planet and the correction due to irradiation. Thus, if Δ = the distance of the planet at the time of observation; D, its true diameter at the distance of the Earth from the Sun; d, the angular diameter as measured; and x, the augmentation of the diameter from irradiation; then

$$D = \Delta (d - x).$$

Hence we have

July 23	21″·393	$-x$	$-1{\cdot}2888\,D$	$= 0$
22	22·028	$-x$	$-1{\cdot}3020\,D$	$= 0$
21	21·991	$-x$	$-1{\cdot}3156\,D$	$= 0$
Feb. 18	23·115	$-x$	$-1{\cdot}3561\,D$	$= 0$
19	23·527	$-x$	$-1{\cdot}3695\,D$	$= 0$
22	24·312	$-x$	$-1{\cdot}4130\,D$	$= 0$
24	24·724	$-x$	$-1{\cdot}4437\,D$	$= 0$
July 10	25·024	$-x$	$-1{\cdot}4858\,D$	$= 0$
Mar. 2	26·593	$-x$	$-1{\cdot}5454\,D$	$= 0$
4	26·837	$-x$	$-1{\cdot}5831\,D$	$= 0$
5	27·081	$-x$	$-1{\cdot}6033\,D$	$= 0$
12	29·624	$-x$	$-1{\cdot}7517\,D$	$= 0$
June 18	33·630	$-x$	$-1{\cdot}9969\,D$	$= 0$
17	34·336	$-x$	$-2{\cdot}0289\,D$	$= 0$
16	35·422	$-x$	$-2{\cdot}0595\,D$	$= 0$
Mar. 26	36·315	$-x$	$-2{\cdot}1308\,D$	$= 0$
27	36·969	$-x$	$-2{\cdot}1654\,D$	$= 0$
28	37·381	$-x$	$-2{\cdot}1957\,D$	$= 0$
29	37·998	$-x$	$-2{\cdot}2318\,D$	$= 0$
June 9	39·406	$-x$	$-2{\cdot}2999\,D$	$= 0$
May 31	46·062	$-x$	$-2{\cdot}6635\,D$	$= 0$
30	46·876	$-x$	$-2{\cdot}7048\,D$	$= 0$
April 18	52·094	$-x$	$-3{\cdot}0402\,D$	$= 0$
20	53·384	$-x$	$-3{\cdot}1215\,D$	$= 0$
21	53·499	$-x$	$-3{\cdot}1582\,D$	$= 0$
May 1	59·152	$-x$	$-3{\cdot}4538\,D$	$= 0$

Since all the equations are of the same weight, D and x may be found by simply taking the means of the two groups, as follows:—

25″·3753	$-x$	$-1{\cdot}49653\,D$	$= 0$
43·7611	$-x$	$-2{\cdot}55800\,D$	$= 0$

From which we derive

$D = 17''{\cdot}321$ Prob. Error $= \pm 0''{\cdot}046$

$x = -0{\cdot}546$

As the sign of the irradiation correction is *minus*, it follows that the contacts have been made too close by half the above quantity, or 0″·273; this appears to be usually the case in daylight observations of *Venus*. It only remains to test the accuracy of the observations by substituting the deduced values of D and x in the preceding equations, and comparing the result with the original measures. In this manner we find for each day of observation: —

Date, 1873.	Computed Diameter.	Observed Diameter.	Obs. — Calc.
	″	″	″
July 23	21·776	21·393	− 0·383
22	22·006	22·028	+ 0·022
21	22·242	21·991	− 0·251
Feb. 18	22·942	23·115	+ 0·173
19	23·174	23·527	+ 0·353
22	23·928	24·312	+ 0·384
24	24·460	24·724	+ 0·264
July 10	25·189	25·024	− 0·165
Mar. 2	26·222	26·593	+ 0·371
4	26·875	26·837	− 0·038
5	27·225	27·081	− 0·144
12	29·795	29·624	− 0·171
June 18	34·042	33·630	− 0·412
17	34·595	34·336	− 0·259
16	35·116	35·422	+ 0·306
Mar. 26	36·361	36·315	− 0·046
27	36·961	36·969	+ 0·008
28	37·486	37·381	− 0·105
29	38·111	37·998	− 0·113
June 9	39·290	39·406	+ 0·116
May 31	45·588	46·062	+ 0·474
30	46·304	46·876	+ 0·572
Apr. 18	52·113	52·094	− 0·019
20	53·522	53·384	− 0·138
21	54·157	53·499	− 0·658
May 1	59·277	59·152	− 0·125

It will be seen that the agreement is generally very good, and there is, I think, reason to believe that in the cases where the difference is sensibly above the average, that it arises from a variation in the amount of irradiation, depending upon the transparency of the atmosphere. Thus, upon the first five days of observation (February 18 to March 2) I have noted that the sky was unusually clear, and the measured diameter is rather too great. On the contrary, upon June 17, June 18, and July 23, the sky was hazy, and the measured diameter appears to be in a

slight degree too small. The value of x given above will, therefore, be understood to apply to the atmosphere in its mean state. Of the other cases of discordance, April 21, May 30, and May 31, I have no explanation to offer, except that the two last were scarcely so satisfactorily observed as the average of the measures.

Durham Observatory,
1873, *August 13th.*

Note on Logarithmic Tables. By Col. Tennant.

I have been glad to see that Mr. J. W. L. Glaisher has brought forward the necessity of some authority to superintend the publication of Mathematical Tables. I have long felt the want. Some such arrangement is necessary, not only to secure accuracy, but to allow the price to be reduced as far as possible.

Mr. Glaisher's researches have only extended as yet to logarithms of numbers, but those of circular functions are fully as important, and in offering a few suggestions, I propose to assume that both will be published and dealt with in the same manner.

It seems to me absolutely necessary that the second of space should be the difference of argument of the Tables of Circular Functions, and that the book of Tables should not be of enormous size. The labour of using Taylor's Tables is very great; Bagay's are not clearly printed, and the volume has a mass of matter in it which adds to its cumbrousness. I believe that for ordinary use seven figures are enough, and I know of no tables which approach Shortrede's, whether for convenience or accuracy. It is the custom in the Indian Survey to compute in duplicate with different sets of tables; in my experience Shortrede's were always preferred by the computers, and I believe that when corrected up according to the list of errata in vols. xxiv. and xxvii. of the *Monthly Notices*, they will be found singularly convenient and singularly accurate. I have never found the nokta inconvenient; it serves to mark the place where the third figure changes, and one knows instinctively that all the logarithms which follow in the same line have the first three figures following in the Table of Numbers, and at the bottom of the page in those of circular functions. In fact, it is only one nokta which is wanted. The figures are rather crowded, especially in the circular functions; but it is impossible to avoid this without increasing the size of the page, and incurring more inconvenience. I think if it were seriously proposed to publish standard 7-figure tables under authority, I should prefer to see Shortrede's taken as the pattern; and I offer the following suggestions as to improvements, in the hope that they might be found useful:—

First, if the stereotype plates now in existence be not used, and the tables be set up again, I would strongly recommend a more